Small Business Innovation Research/Small Business Tech Transfer

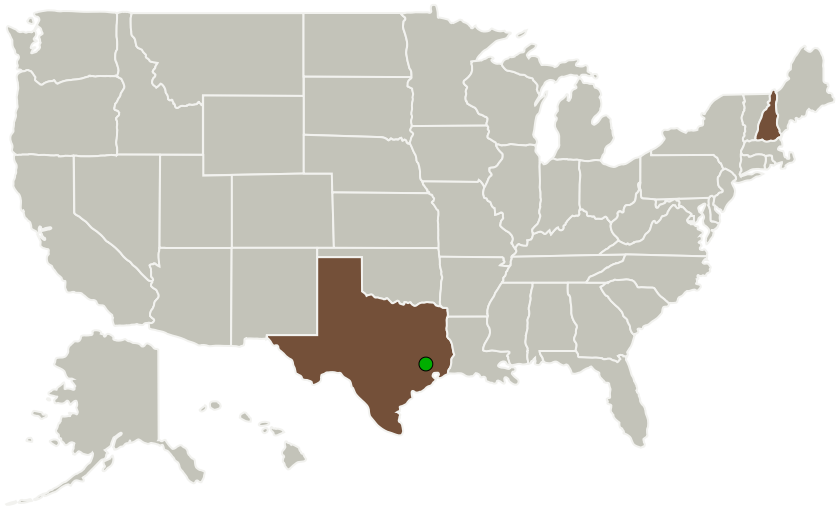
Compact, Lightweight, Non-Venting, Phase-Change Heat Exchanger, Phase I

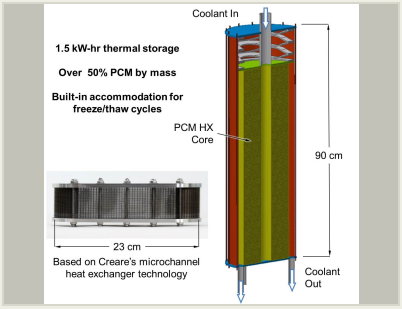
Completed Technology Project (2016 - 2016)

Project Introduction

Future exploration spacecraft will need to operate in extreme thermal environments, with highly variable conditions for heat rejection by thermal radiation. Thermal storage is a critical technology for these missions, since it enables the spacecraft's thermal management system to be sized for average conditions instead of the least favorable. We propose a new technology for thermal storage based on an innovative, non-venting phase-change heat exchanger. Creare's technology overcomes some of the key limitations of phase-change heat exchanger technology. Our design maximizes the amount of phase-change material, eliminates large thermal resistances due to the poor thermal conductivity of the phase-change material, and accommodates differences in solid vs. liquid volume without a heavy structure. In Phase I we will prove the feasibility of this approach through thermal, fluid, and structural analysis; assessment of critical trade-offs; proof-of-concept demonstrations; and design of a prototype phase-change heat exchanger sized to meet requirements for future space exploration missions. In Phase II we will design, build, and demonstrate operation of the prototype phase-change heat exchanger.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
New Hampshire	Texas

Project Transitions

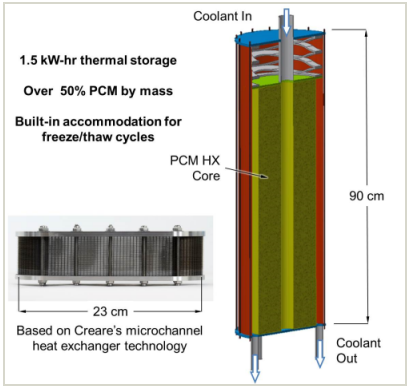
June 2016: Project Start

December 2016: Closed out

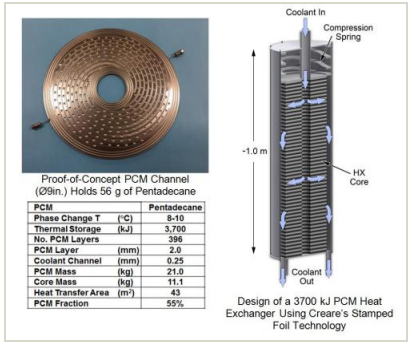
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139713)*

Images



Briefing Chart Image
Compact, Lightweight, Non-Venting, Phase-Change Heat Exchanger, Phase I *(https://techport.nasa.gov/image/135184)*



Final Summary Chart Image
Compact, Lightweight, Non-Venting, Phase-Change Heat Exchanger, Phase I Project Image *(https://techport.nasa.gov/image/131167)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Creare LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

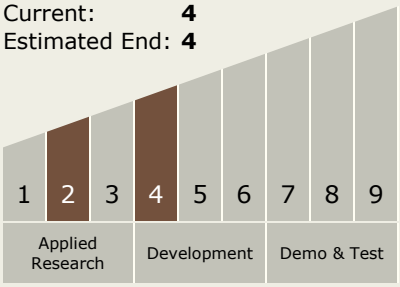
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Michael G Izenson

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System